

Bibliographic Essay
21-9475 (Slifer)

The future of Long-Range Strike (LRS) for the US Air Force centers on the concept of a Next Generation Bomber (NGB), a long-range bomber aircraft to be fielded by 2018. The NGB is a topic of much interest to the military industrial complex; the Department of Defense, Congress, and defense contractors alike have published opinions and considerations pertaining to this future aircraft. In order to understand the issues surrounding the acquisition of a NGB, resources on the topic can be broken into the following categories: Necessity/Feasibility, Performance, Nuclear/Conventional Options, and Manned/Unmanned Options. Before presentation of the resources, some background information including an explanation of these categories is necessary.

Long-Range Strike is important because it allows the United States to project power, which is important in peacetime and in any kind of war, whether it be conventional or unconventional. The first question pertaining to LRS, however: Is a NGB necessary? Or are there other better and more viable options such as sea-launched cruise missiles or long-range ballistic missiles? If the NGB is necessary, is it feasible from the standpoint of time and budget? The next key consideration for any aircraft is its performance. Performance consists of measurable characteristics such as range, speed, payload, and survivability. These characteristics are tied to requirements but can be limited by available technology such as engine design, weapon types, and defensive avionics. While the end of Cold War has changed the discussion on nuclear weapons, it is still an important consideration for employment on the NGB. Should the NGB be nuclear capable from the initial design or are air-launched nuclear weapons by-gone? The explosion of remotely piloted vehicle (RPV) technology has brought the option for an unmanned bomber to the forefront of discussion. The available technology and the timeline for the bomber production will likely be in conflict for this decision.

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There is considerable information from credible sources pertaining to the necessity of a NGB. The Congressional Research Service's (CRS) Report for Congress, *Air Force Next-Generation Bomber: Background and Issues for Congress*, presents detailed discussion between the Department of Defense and Congress about the necessity of a NGB. The Senate Armed Services Committee found that "Long-range strike is a critical mission in which the United States needs to retain a credible and dominant capability."¹ The Pentagon convened a Tiger Team² to look into the issue and consequently the 2006 Quadrennial Defense Review (QDR) called for a land-based, future bomber to be fielded by 2037. The QDR also recommended that a NGB be fielded by 2018 as a stop-gap for current aging bombers even as they go under continuous modification.³ The CRS report also presents industrial-base considerations for the NGB, saying technologies such as "integrated avionics, low-observables and highly complex computer processors must be nurtured to avoid atrophy...Once lost, rebuilding the skills for designing, producing and sustaining defense-unique capabilities is difficult, expensive and time-consuming."⁴

The Center for Strategic and Budget Assessments (CSBA), a policy research organization, published a report in February 2009 estimating a NGB "acquisition program including the procurement of 50 to 60 aircraft might have an acquisition (i.e., research and development plus procurement) cost of \$30 billion to \$40 billion."⁵ The CRS report also presents detailed funding issues and discussion between DoD and Congress. Specifically, it notes that there is no funding for the NGB in the FY2010 budget⁶ and addresses how Congress needs to consider the current bomber force but also how their decisions "could affect Air Force capabilities and funding requirements, and the U.S. aircraft manufacturing industrial base."⁷ This funding decision was partly based on Secretary of Defense Robert Gates' speech in April of

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2009 where he stated that the USAF needed a better “understanding of the need, the requirement, and the technology”⁸ before moving forward, but also from President Obama’s announcement to cut the NGB in May 2009. In his Office of Management and Budget report he said “there is no urgent need to begin an expensive development program for a new bomber” and that “the future bomber fleet may not be affordable over the next six years.”⁹ Germane to this decision of necessity is performance: What type of bomber do we need and what will it need to do?

Performance is what characterizes an aircraft and the most important aspects for a bomber are range, speed, payload, and survivability. CSBA’s report, *The Case for Long-Range Strike: 21st Century Scenarios*, describes the NGB as needing to reach deep targets, strike intercontinental targets, conduct Time Sensitive Targeting (TST), and be able to defend against threats.¹⁰ To accomplish these goals, the USAF reported that the NGB would need to be “subsonic and stealthy; it might have an unrefueled range of 2,000 to 3,000 miles; and it might carry 28,000 to 40,000 pounds of armaments.”¹¹

There are several sources that analyze the performance characteristics. In the Air Force Associations Special Report, *Return of the Bomber: The Future of Long-Range Strike*, Dr Rebecca Grant states bluntly, “Range is the supreme requirement.”¹² The intercontinental range of a NGB dissuades adversaries from simply moving important targets deep inland to avoid being struck. Dr Grant considers some of the longest potential intercontinental strikes and claims that the NGB should have an unrefueled range of 3,500 nautical miles. This range allows for a bomber to strike deep into territories where the US is not likely to have basing rights.¹³

When considering speed, the question is usually whether a NGB should be supersonic or fly only at high subsonic airspeeds. Dr Grant’s AFA report states that a hypersonic (Mach 6+) will not be available by 2018 despite continued research by the Air Force Research Lab (AFRL).

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In *U.S. Air Force Bomber Modernization Plans: An Independent Assessment*, a report by the Center for Strategic and International Studies (CSIS), the author states that an NGB would be impervious to threats at Mach 3+ above 70,000 feet, but that stealth materials are “unproven beyond Mach 2+”¹⁴ Additionally, Dr Grant points out that a Mach 2+ bomber would sacrifice much in range, but more importantly, such an endeavor would require development of a new engine which would be unlikely for 2018. “The safer bet is a 2018 bomber with high subsonic speed that can be achieved now with near-term engine technology. It poses no new problems for stealth, survivability, weapons release, and systems integration.”¹⁵

Dr Grant’s AFA report also presents a good discussion of how the NGB will be the first bomber designed solely for precision weapons. With smaller bombs like the Small Diameter Bomb (GBU-39) and 500-lb JDAMs (GBU-38), it is possible the NGB could carry a smaller overall payload yet still have the effect of a larger bomber: “penetrate hardened aircraft shelters, armor, and other battlefield targets.”¹⁶ This would also allow the NGB to have a smaller signature. While this is one option, the argument is whether a NGB should be capable of carrying heavier weapons such as the GBU-28 (5,000 lb class). A heavy bomber is required to carry this weapon and it is likely that an option to carry several will be required.¹⁷

The CSBA report (*The Case for Long-Range Strike*) presents a detailed discussion of aircraft survivability in terms of a NGB. The aircraft should be able to “operate day or night in airspace defended by advanced surface-to-air missiles (SAMs),” some of which “will be able to intercept and destroy airborne targets, including stealth aircraft and cruise missiles, at distances “of up to 400 kilometers (250 miles).”¹⁸ Low observable (LO) technology must be used, which include consideration of not only radar signature, but also infrared, acoustic and visual signatures.¹⁹ While the world of electronic combat is a continual arms race with uncertainty as

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to what air threats will be developed in the future by our adversaries, it is clear that US technology is ahead of the fielded threats. The NGB will enjoy decades of technology and research from the F-22 and F-35 programs.

The trend toward conventional use of bombers does not preclude the NGB from having a nuclear capability. However, the demise of the Soviet Union began the move away from nuclear-only bombers. The CSBA report presents a cogent discussion of the nuclear issue. President George H.W. Bush decided to cut the procurement of B-2 aircraft by two-thirds after the collapse of the Warsaw Pact. He also signed an agreement with the Russian Federation to allow up to 100 bombers (non-cruise missile capable) to be modified to conventional bombers. For the US, this was the change in role for the B-1. The report further argues that Operation IRAQI FREEDOM is the first time all three bombers were considered conventional platforms. The role of the B-1 as a persistent, on-call fire support platform proved to be very successful in the current counter-insurgency campaign in Iraq and Afghanistan. Thus, the NGB will likely require a similar capability to conduct persistent Intel, Surveillance, and Reconnaissance (ISR) as well as deliver differing payloads. The CSBA report calls a conventional-only NGB tempting, but does suggest at least preparing for a potential upgrade to nuclear weapons with such designs as necessary for protection against electromagnetic pulses and high-powered microwave weapons. These capabilities are much more easily accomplished in preliminary design rather than later after full-rate production.²⁰

Unmanned Aerial Vehicles (UAVs) appear to be the way of the future. During a May 2009 hearing before the Senate Armed Services Committee, Secretary Gates said, "One of the things I think we need to think about is whether, for example, the follow-on bomber needs to have a pilot in it."²¹ The AFA report claims "the technology of unmanned air vehicles has

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progressed to the point where the Air Force can consider building a manned bomber or an equally capable unmanned bomber. More likely, it will be a platform that can switch back and forth from manned or unmanned missions.”²² This seems to be a trend as the 2006 QDR stated: “Approximately 45 percent of the future long-range strike force will be unmanned” by 2025.²³ Dr Grant states that the most difficult part to unmanned flight is the takeoff and landing. This task requires very accurate position readings for the task to be autonomous. Additionally, air refueling is a big challenge for future UAVs. While some ISR UAVs (like Global Hawk) are able to achieve persistence without air refueling, the NGB will have a greater payload and therefore likely require air refueling. Research and development is coming to fruition, as AFRL has proved some concepts with UAV air refueling.²⁴

The Next Generation Bomber is likely to be the most expensive acquisition program in the history of the US Air Force; however it is an important aspect for the future of Long-Range Strike. There are many resources available for understanding the issues pertaining to the NGB, most of them written by defense contractors and the USAF. Resources considering the necessity and feasibility, performance factors, options for nuclear/conventional weapons, and options for unmanned platforms for the NGB project are presented above and provide a good starting point for further analysis.

¹ Ronald O’Rourke, *Air Force Next-Generation Bomber: Background and Issues for Congress* (Washington DC: Congressional Research Service, 20 Oct 2009), 23.

² Ibid., 13.

³ Department of Defense, *Quadrennial Defense Review Report* (Washington DC: Department of Defense, 2006), 46.

⁴ Ronald O’Rourke, *Air Force Next-Generation Bomber*, 21.

⁵ Marcus Weisgerber, “CSBA: USAF Next-Generation Bomber Program Could Cost \$40 Billion,” *Inside the Air Force*, February 6, 2009

⁶ Ronald O’Rourke, *Air Force Next-Generation Bomber*, 1.

⁷ Ibid., 1.

⁸ Department of Defense, *Defense Budget Recommendation Statement (Arlington, VA), As Prepared for Delivery by Secretary of Defense Robert M. Gates, Arlington, VA, Monday, April 06, 2009*, available online at <http://www.defenselink.mil/speeches/speech.aspx?speechid=1341>

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⁹ Ronald O'Rourke, *Air Force Next-Generation Bomber*, 23.

¹⁰ Barry D. Watts, *The Case for Long-Range Strike: 21st Century Scenarios* (Washington DC: Center for Strategic and Budgetary Assessments, 2008), 34.

¹¹ Ronald O'Rourke, *Air Force Next-Generation Bomber*, 5.

¹² Rebecca Grant, *Return of the Bomber: The Future of Long-Range Strike* (Arlington, VA: Air Force Association, 2007), 21.

¹³ Rebecca Grant, *Return of the Bomber*, 21.

¹⁴ Chuck A. Murdock, *U.S. Air Force Bomber Modernization Plans: An Independent Assessment* (Washington DC: Center for Strategic & International Studies, 2008), 25.

¹⁵ Rebecca Grant, *Return of the Bomber*, 24.

¹⁶ Ibid., 22.

¹⁷ Ibid., 22.

¹⁸ Barry D. Watts, *The Case for Long-Range Strike*, 4.

¹⁹ Ibid., 5.

²⁰ Ibid., 17.

²¹ Ronald O'Rourke, *Air Force Next-Generation Bomber*, 10.

²² Rebecca Grant, *Return of the Bomber*, 25.

²³ Department of Defense, QDR.

²⁴ Rebecca Grant, *Return of the Bomber*, 27.

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